JTA ANNEX _ MODELING & SIMULATION STANDARDS

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TO DO LIST:

ANNEX _ MODELING & SIMULATION DOMAIN STANDARDS

MODELING & SIMULATION ANNEX

This annex is configuration managed by the Defense Modeling and Simulation Office (DMSO).

_.1 INTRODUCTION

_.1.1 Purpose

This annex identifies the minimum information standards applicable to models and simulations (M&S) for all DoD programs.

_.1.2 Scope

This annex provides a set of standards affecting the definition, design, development, execution and testing of models and simulations. DoD modeling and simulation ranges from high-fidelity engineering simulations to highly aggregated, campaign-level simulations involving joint forces. Increasingly the Department is interoperating a mix of computer simulations, actual warfighting systems, weapons simulators and instrumented ranges to support a diversity of applications including training, mission rehearsal, operational course of action analysis, investment analysis, and many aspects of acquisition support including; requirements definition, concept exploration, design , test and evaluation, manufacturing, and life-cycle support.

Department of Defense Directive 5000.59, *DoD Modeling and Simulation (M&S) Management*, January 4, 1994, and DoD 5000.59-P, DoD *Modeling and Simulation (M&S) Master Plan* (MSMP), October 1995, outline DoD policies, organizational responsibilities and management procedures for M&S and provide a comprehensive strategic plan to achieve DoD's vision of readily available, authoritative, interoperable and reusable simulations.

Objective 1 of the DoD MSMP states "Provide a common technical framework for M&S" and includes, under sub-objective 1-1, the establishment of "a common high level simulation architecture to facilitate the interoperability of all types of simulations among themselves and with C4I systems, as well as to facilitate the reuse of M&S components." To meet this objective the Under Secretary of Defense for Acquisition and Technology (USD(A&T)) in 1996 designated the High Level Architecture (HLA) as the standard technical architecture for all DoD simulations. The HLA is a technical architecture that applies to all classes of simulations, including virtual simulations, constructive simulations, and interfaces to live systems. The virtual simulation class comprises human-in-the-loop simulators. The constructive simulation class includes wargames and other automated simulations which represent actions of people and systems in the simulation. The live simulation class includes C4I systems, operational platforms, and instrumented ranges.

_.1.3 Background

The HLA is a progression from the previous architectures and associated standards which have been developed and used successfully for specific classes of simulation. These include Distributed Interactive Simulation (DIS) protocol standards which support networked, real-time, platform-level virtual simulation and the Aggregate Level Simulation Protocol (ALSP) which is used to support distributed, logical-time, constructive simulations. The HLA provides a common architecture for all classes of simulation and, consequently, the HLA supersedes both the DIS and ALSP standards. Transition of simulations from use of ALSP and DIS is underway in accordance with policy.

_.2 MANDATES

_.2.1 Introduction

The following standards apply uniquely to the modeling and simulation domain.

The efficient and effective use of models and simulations across the Department of Defense requires a common technical framework for M&S to facilitate interoperability and reuse. This common technical framework consists of: (1) a high-level architecture (HLA) to which simulations must conform; (2) conceptual models of the mission space (CMMS) to provide a basis for the development of consistent and authoritative M&S representations; and (3) data standards to support common understanding of data across models, simulations, and live systems. Any standards for the CMMS and any data standards beyond those available in Part 2 of the JTA will be provided in subsequent versions of this document.

The Under Secretary of Defense for Acquisition and Technology (USD(A&T)) on September 10, 1996 designated the High Level Architecture (HLA) as the standard technical architecture for all DoD simulations.

_.2.2 Information Processing Standards

In addition to those mandates for Information Processing Standards described in Part 2.1 of the JTA, the following are unique mandates applicable to the modeling and simulation domain.

The HLA, which was mandated DoD-wide by USD(A&T) on September 10, 1996, is defined by the HLA Rules, the HLA Interface Specification and the HLA Object Model Template Specification. The following standards are mandated, current versions of which are listed and available at the Defense Modeling and Simulation Office World-Wide Web site (http://www.dmso.mil).

_.2.2.1 HLA Rules

The HLA rules describe the responsibilities of federates (simulations, supporting utilities, and interfaces to live systems) and federations (sets of federates working together to support HLA distributed applications). The rules comprise a set of underlying technical principles for the HLA. For federations, the rules address the requirement for a federation object model (FOM), object ownership and representation, and data exchange. For federates, the rules require a simulation object model (SOM), time management in accordance with the HLA Runtime Infrastructure (RTI) time management services, and certain restrictions on attribute ownership and updates.

- High Level Architecture Rules, Version 1.2, dated 13 August 1996

_.2.2.2 HLA Interface Specification

In the HLA, federates interact with an RTI (analogous to a special-purpose distributed operating system) to establish and maintain a federation and to support efficient information exchange among simulations and other federates. The HLA interface specification defines the nature of these interactions, which are arranged into sets of basic RTI services.

- High Level Architecture Interface Specification, Version 1.2, dated 13 August 1997

_.2.2.3 HLA Object Model Template Specification

The HLA requires simulations (and other federates) and federations to each have an object model describing the entities represented in the simulations and the data to be exchanged across the federation. The HLA object model template prescribes the method for recording the information in the object models, to include objects, attributes, interactions, and parameters, but it does not define the specific data (e.g., vehicles, unit types) that will appear in the object models.

- High Level Architecture Object Model Template, Version 1.2, dated 13 August 1997

_.2.3 Information Transfer Standards

There are no unique Information Transfer Standards applicable to modeling and simulation beyond those specified in Part 2.3 of the JTA.

_.2.4 Information Modeling And Information Standards

In addition to those mandates for Information Modeling and Information Standards described in Part 2.4 of the JTA, the following are unique mandates applicable to the modeling and simulation domain.

_.2.4.1 Object Model Template Data Interchange Format

A data interchange format has been adopted as an input/output vehicle for sharing HLA object models presented in the standard Object Model Template (OMT) among object model developers and users.

- Object Model Template Data Interchange Format (OMT DIF), Version 1.0, December 1996.

_.2.4.2 Standard Simulator Database Interchange Format

Standard Simulator Database Interchange Format (SIF) - A DoD data exchange standard (MIL-STD-1821) adopted as an input/output vehicle for sharing externally created simulator databases among the operational system training and mission rehearsal communities. SIF will be replaced by the Synthetic Environment Data Representation Interchange Specification (SEDRIS). (See Section _.3 of this document)

_.2.5 Human-Computer Interfaces

There are no unique Human-Computer Interface standards applicable to modeling and simulation beyond those specified in Part 2.5 of the JTA.

_.2.6 Information Systems Security

There are no unique Information Security Systems standards applicable to modeling and simulation beyond those specified in Part 2.6 of the JTA.

_.3 EMERGING STANDARDS

The efficient and effective use of models and simulations across the Department of Defense requires a common technical framework for M&S to facilitate interoperability and reuse. Beyond the HLA, this common technical framework consists of conceptual models of the mission space (CMMS) to provide a basis for the development of consistent and authoritative simulation representations; and data standards to support common understanding of data across models, simulations, and live systems. Any standards for the CMMS and any data standards beyond those available in the DoD Data Model will be provided in subsequent versions of this document.

_.3.1 Synthetic Environment Data Representation Interchange Specification (SEDRIS)

No standard currently exists for comprehensively describing and interchanging environmental data in all domains (terrain, ocean, atmosphere, and space) among M&S applications supporting the broad range of acquisition, analysis, and training requirements. SEDRIS establishes a uniform and effective interchange specification for the pre-runtime distribution of source data and integrated databases. The specification encompasses a robust data model, data dictionary, and interchange format with read and write application programmer's interfaces (APIs). While designed to meet M&S community requirements, the interchange specification has the potential for also being used for natural environment data in DoD operational systems.

_.3.2 Federation Execution Data Interchange Format (FED DIF)

Federation Execution Data Interchange Format (FED DIF) (under development) - A data interchange format is being developed as an input/output vehicle for sharing HLA initialization data. This DIF will contain a data from the OMT as well as additional initialization data needed by the HLA Runtime Infrastructure (RTI) and other HLA initialization tools. The content of the FED DIF will be compliant with the HLA Interface Specification referenced above.

_.3.3 Object Model Content Standards

Object Model Content Standards are being developed to support the development and reuse of Federation Object Models (FOMs) and Simulation Object Models (SOMs). This will greatly reduce the time needed to develop new HLA applications and transition legacy systems to HLA. Initially content standards are being developed based on the requirements of several programs which are early adopters of the HLA standards. The early adopter programs cover a broad range of simulation applications from engineering to analysis and multiple levels of aggregation from platform-level (previously addressed by the IEEE 1278.1 Protocol Data Unit standards) to aggregate unit simulations (previously addressed by the Aggregate Level Simulation Protocol). The object model requirements of these programs are being consolidated into a set of common set of data elements, specifying both semantics and syntax. Where existing DoD standards do not exist, they will be developed through the HLA Object Model Content Standards process.